The LaRouche Youth Movement in Los Angeles examines the "curvature" of the Rural Electrification Administration: how it changed America's history.

Ensign John Gay/U.S. Navy

Formation of a shock front: As flight speed approaches the speed of sound, the temperature and pressure of air flowing over the aircraft surface drops, producing this cloud of condensed water vapor. Even at flight speed slightly below the speed of sound, the air flowing over bumps on the surface of the plane can become supersonic: It heats up, and a shock wave develops, producing the sharp termination of the conical condensation cloud. This photo of an F/A-18 Hornet was taken from the upper deck of the USS Constellation.

Below: President Franklin Roosevelt, March 1933.

Library of Congress

Franklin Roosevelt's Economic Shock Front

by Sky Shields

SCIENCE and the LaRouche Youth Movement

The main failing of all of modern economics teaching, from free-trader to socialist, is its inability to recognize, with scientific certainty, the crucial distinction between human beings and animals. Only this recognition could possibly form the basis for a valid science of human economics. The revival of this essential concept and its elaboration by economist Lyndon LaRouche has been the basis for a long-term project embarked upon by a group of us in the Los Angeles office of the LaRouche Youth Movement (LYM). This article represents a summary discussion of approximately one year's work, spanning a number of presentations attempting to flesh out the specifics of the LaRouche-Riemann method, using Franklin Roosevelt's economic policies as a case study.

This began with an investigation of what LaRouche has called the "curvature" of an economic process, where we investigated the work of both Carl Friedrich Gauss and Bernhard Riemann on complex functions and LaRouche's application of the same to economic processes. We continued this investigation with a study of the transfinite orderings in a human economic process, using the investigation of such physical phenomena as Riemann's forecast of the acoustic shock in wave propagation—a phenomenon LaRouche has called an "economic shock wave." We next returned, at the prompting of another couple of papers by Lyndon LaRouche,[1] to the further development of Gauss's curvature concept in the form of his work on potential. All of these phenomena LaRouche has stressed as being crucial to recognize the physical-mathematic characteristics of a characteristically human economic growth process.

At first glance, a most obvious distinction is apparent between human and animal processes—so apparent that it is recognized (with a grimace) even by ecologists who would seek to deny such a distinction. This is the fact that although there has seemed to be a cap on the growth of all animal populations (including the "higher apes"), the growth of the human population has continued steadily—though with brief, but notable interruptions—throughout its entire existence (Figure 1). This, however, only serves to describe a perceived effect. One which is not *necessarily* unique to human

societies—after all, wouldn't any animal population increase similarly given the proper environmental conditions? This forces us to take a second look at what is actually the underlying cause of the effect seen: Not only has there been a steady growth in the *actual* human population, but also a growth in the *potential* population, per unit land area, given certain environmental conditions. This potential population does not change for any lower animal species, although favorable changes in environmental conditions (for example, the human act of greening a desert, or terraforming Mars) may allow for such an increase in *actual* animal populations which were otherwise impossible.

The obvious, first-approximation cause for this growth in human potential is also not to be denied even by so-called free-traders and ecologists who would seek to disagree with our initial premise: the discovery, development, and application of new technologies by human minds to human processes. This application can, also in first approximation, be broadly classed into two distinct areas: one, the machine tools utilized in capital goods production; and two, basic economic infrastructure such as health care, transportation, water management, and power production and distribution. Combined, these provide the physical basis for the steady growth in what LaRouche has termed the *potential relative population density* of the human species. The following investigation has been undertaken toward the goal of consciously harnessing, directing, and accelerating this growth—in both productivity and living standards—to counter the current precipitous global collapse now being recklessly aggravated by the economic policies typified by the George Shultz-steered Bush and Schwarzenegger administrations. Hopefully, it will soon be repeated in other parts of the world.

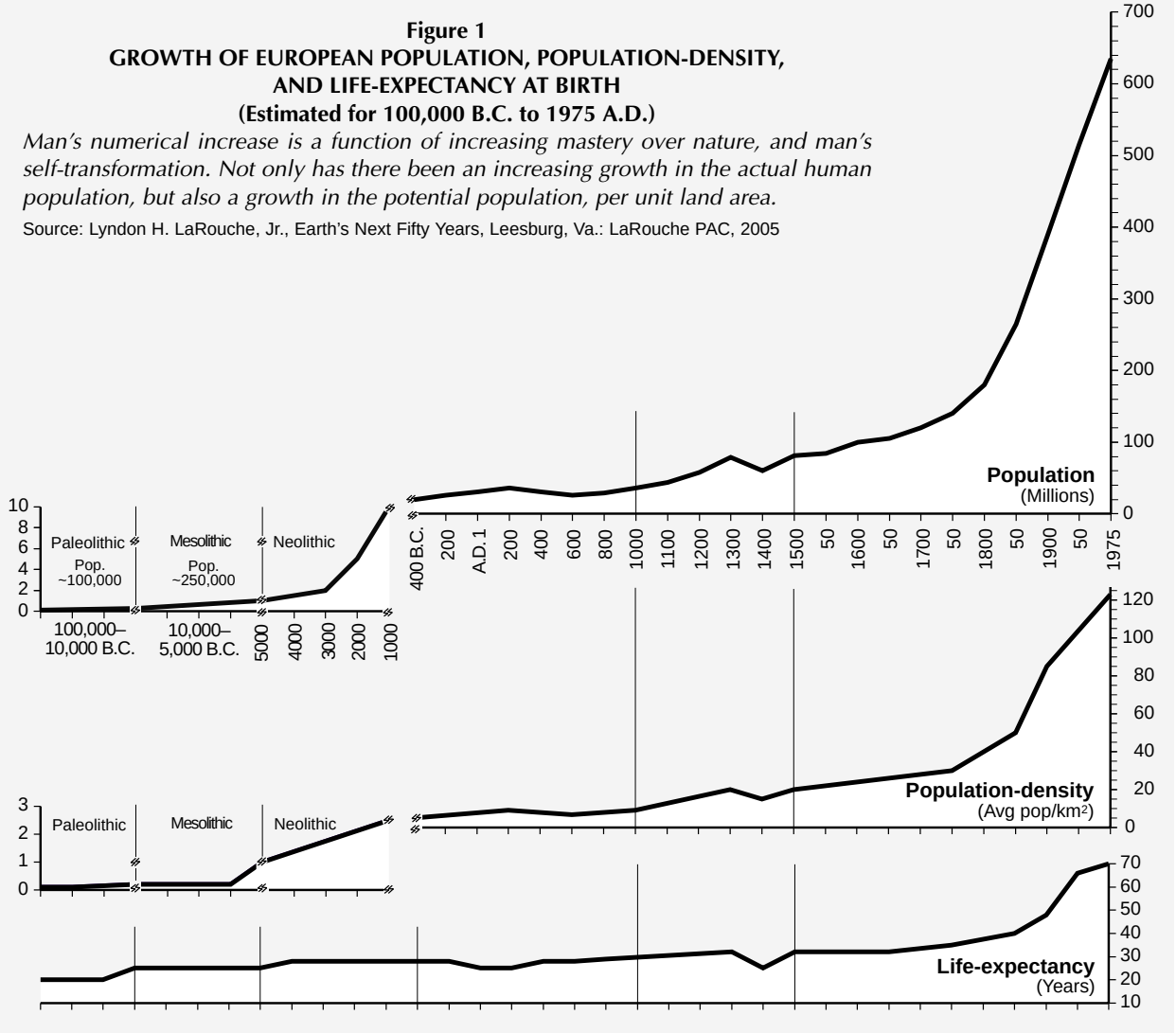
The Depression and the Farmer

The situation faced by Franklin Delano Roosevelt when he entered office in 1933 was daunting. Under President Calvin Coolidge—installed after President Harding's death in 1923—

Figure 1
GROWTH OF EUROPEAN POPULATION, POPULATION-DENSITY, AND LIFE-EXPECTANCY AT BIRTH
(Estimated for 100,000 B.C. to 1975 A.D.)

Man's numerical increase is a function of increasing mastery over nature, and man's self-transformation. Not only has there been an increasing growth in the actual human population, but also a growth in the potential population, per unit land area.

Source: Lyndon H. LaRouche, Jr., Earth's Next Fifty Years, Leesburg, Va.: LaRouche PAC, 2005



Before the Rural Electrification Administration, densely populated areas received the benefits of electricity, but rural areas were neglected by utility companies because laying the lines was considered unprofitable.

Treasury Secretary and bankers' asset Andrew Mellon had systematically starved the physical economy to feed a bloated speculative bubble. Mellon had capped the expenditures budget for the Federal government, preventing investment in the very sorts of processes we identified above as being necessary for human development—infrastructure, education, manufacturing, technological research and development, and so on—and funneled all excess money into servicing financial debt. A speculative frenzy was promoted, which drove stock market prices sky-high, while labor and the physical economy were being asphyxiated.

A post-World War I farm crisis, blamed on "over-production," but caused by this Darwinian "survival of the fittest" economic policy, was intentionally aggravated by Mellon. A bill twice passed by Congress to provide for price regulation on farm goods (by allowing farmers to dump surplus goods on the foreign market), was vetoed once by Mellon through President Coolidge, and again by Mellon through President Herbert Hoover, forcing American farmers into a trap in which the more they produced, the cheaper their goods became. *After* Mellon's speculative insanity had created the stock market crash of 1929 under the Hoover Administration, Mellon, like Bush and Schwarzenegger today, then further aggravated the situation by pushing a program of radical austerity, budget balancing, and "belt tightening," thoroughly decimating the population in an attempt to keep the financial interests afloat.[2]

Despite the introduction and incorporation of electricity into the lives of most Americans, only about 10 percent of the farms in the country had electricity at that time. Farm life was back-breaking work, which began at the crack of dawn with the first precious hours of sunlight, and ended after dark in pitch blackness. Light afforded by kerosene lanterns was dangerous and inadequate, and as a result of all of this, little or no time was left for the mental development of the youth of rural families (Figure 2).

Because of this lack of electricity, disease, parasites, and malnutrition were rampant in rural areas of the country. The contamination of the water supply by outhouses caused diseases such as typhoid and dysentery, while hookworm infection sapped the strength of much of the population (with a more than 50 percent infection rate in some southern schools).[3] Lack of refrigeration caused further diseases and malnutrition, which, in turn, caused fatigue as well as consid-

Rural Electrification News

Figure 2
BEFORE AND AFTER ELECTRIFICATION
Cartoons like these, illustrating the perils of farm life without electrification, were widely distributed in the Rural Electrification News *magazine.*

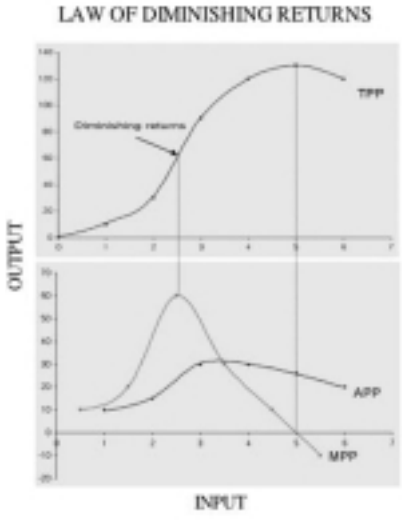


Figure 3
THE LAW OF DIMINISHING RETURNS
In a closed system, shortage of an essential input such as energy produces an apparent boundary condition. To the accountant, or victim of Econ 101 class, it may appear as an unsurpassable obstacle.

erable physiological damage to the brain development of many in rural areas.[4]

Despite these conditions, easily remediable by the introduction of basic infrastructure and conveniences, utility companies had refused to provide service to these areas. Their argument was that, unlike the densely populated urban and suburban regions, where every inch of line from the power plant to the furthest consumer was connected directly to another consumer, most of the line laid to reach the remote farms in the underpopulated South and Midwest would be essentially useless and unprofitable. The only way such a venture were even thinkable would be for the farmer to pay an initial deposit to cover the costs of building. This, of course, would be impossible for all except the most profitable farms. Moreover, the lifestyle of the farmer required so little electricity—and this mainly in the two to three peak hours just after sunset—that the rates which the utilities would have to charge during those hours would be well out of the range of any farmer.[5]

Rural rates were already far in excess of those charged in city areas. Roosevelt himself commented in 1938, regarding his 1924 stay in Georgia to treat his polio, "When the first of the month bill came in for electric light for my little cottage, I found that the charge was 18 cents a kilowatt hour—about four times what I pay at Hyde Park, New York." These circumstances formed a seemingly insurmountable boundary condition, created by the immutable laws of diminishing returns and supply and demand (as any Economics 101 student has been trained to tell you)—a product of the asymptotic infinity posited by the very nature of economics as the "science of scarcity" (Figure 3).

Embedded Infinities

"Infinity," however, is a very apt term for this sort of boundary. What, after all, is the infinite? The first images which come to mind may be the vast expanse of space, or perhaps a series of numbers growing larger and ever larger without end, or, maybe, the greatest infinite trump card of all, "God," may be invoked. These "infinities" as presented, however, never actually live up to the term. They are simply *uncountables:* quantities which are "bigger than I can imagine." The limitation in each of these cases is not objective, but rather subjective. Then, are there really no *actual* infinities?

Let us take a more rigorous case: that of Cardinal Nicholas of Cusa's squaring of the circle (Figure 4). The attempt to approximate the circumference of a circle with inscribed and circumscribed polygons leads us to the recognition that, regardless of how many times we multiply the sides of a polygon, the circle as a figure is unattainable in this manner. The circle as an actual (not imagined) existence, from the standpoint of the polygon is truly infinite.[6] However the circle—as a figure—we can recognize and create as a single, finite, idea. The infinity here is simply an indication of a discontinuous change of state: a point where the limitations of the nature of the algebraic magnitudes generating the polygon force us to

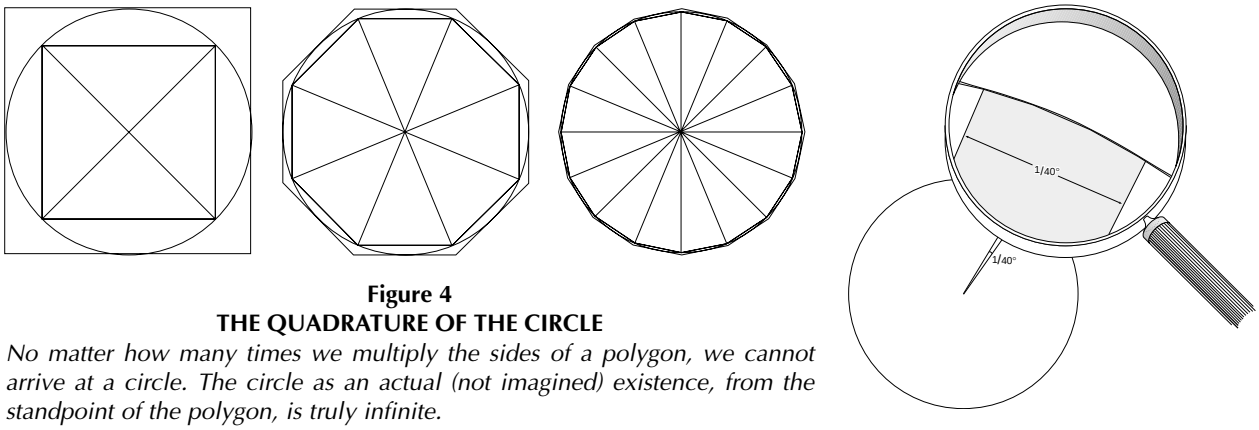
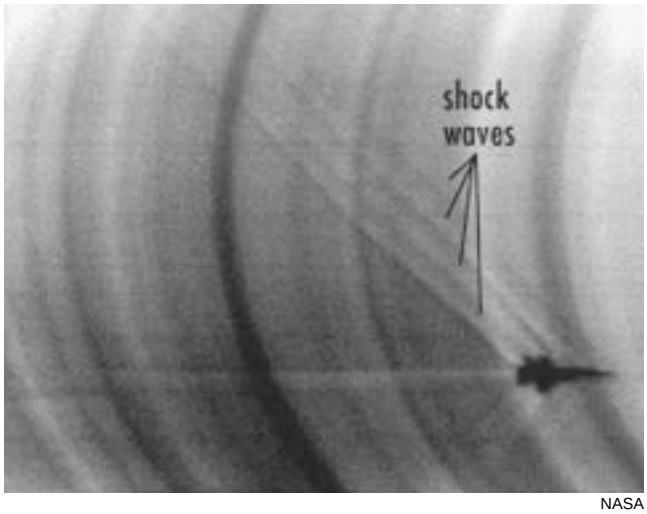


Figure 4
THE QUADRATURE OF THE CIRCLE
No matter how many times we multiply the sides of a polygon, we cannot arrive at a circle. The circle as an actual (not imagined) existence, from the standpoint of the polygon, is truly infinite.

Source: *Fidelio*, Summer 2001



NASA

The shock waves are visible as this plane breaks the sound barrier.

leave them behind, in favor of a transcendental mode of representation.[7]

This discontinuity is of the same quality as that recognized by Bernhard Riemann in his 1856 paper, "On The Propagation of Plane Air Waves of Finite Magnitude."[8] There, Riemann takes a phenomenon which had been recognized by mathematicians before him—the fact that the differential equations for fluid flow all approach insurmountable infinities once velocities approach the limit for the propagation of a wave in that medium—and demonstrates that this infinite discontinuity is really a part of a higher-order, continuous function. This mathematical infinity is later encountered, physically, during the 1940s, as the so-called "sound barrier."

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Many at that time declared this "wall of sound" to be unbridgeable: instrumentation failed; the laws of lift seemed to reverse themselves, forcing planes into a steep dive; and maneuverability disappeared almost completely, hurling those unfortunate enough to encounter this barrier into a helpless trajectory, straight into the ground. The laws of physics themselves seemed to dictate a barrier beyond which man was not allowed to penetrate. However, Riemann had already demonstrated that this "barrier" was no such thing *almost a century prior!* This phenomenon of seeming infinities fascinated Riemann, and formed the basis for many of his physical investigations. These "transfinite" orderings proved to be characteristic of physical processes in general, and as such, it should not be surprising to see them make their appearance in the science of physical economy.

Like the breaking of the "sound barrier," rural electrification, as directed by the Roosevelt Administration, transformed the geometry (or field) in which the physical phenomena observed by the utility companies was taking place. And, just as the incorporation by Adolf Busemann and Ludwig Prandtl of Riemann's higher-order conception into the construction of planes during the late 1940s proved the existing mathematics to be obsolete in the case of supersonic flight, the incorporation of a new physical principle of social organization into the economic processes of the 1930s, demonstrated the financial accounting methods of the utilities to be incompetent. The act of electrifying the rural areas transformed the productive potential of the entire country, thus increasing the amount of production of real, physical wealth such as capital goods and—most important—functioning, developed human minds. That, in such a way that even the operations in city areas were transformed in their efficiency.

Thus, the geometric transformation of increased *power* (physical economics as defined here) redefines the expression of mere *energy* (financial profit), thereby absorbing the embedded "infinites" of a physical process into a higher-ordered whole. This is the only sane, anti-entropic definition of *profit* which the true economist (as opposed to the accountant) should allow. The rules of accounting, like those of mathematics, are meant to be broken, as has been illustrated by the entire history of human development until the present day.

The real reason for the hesitancy of the utilities, and for their high rates, however, was another form of speculative insanity which had been promoted under Mellon. Massive parasitical financial structures called Holding Companies had attached themselves to the utility companies. Buying up assets in the form of entire businesses, these companies fed off the inflated stock values of the utilities, servicing this debt by sucking from the physical economy in the form of increased rates and lack of infrastructural development, a phenomenon similar to that which Lyndon LaRouche has illustrated with his Triple Curve collapse function (Figures 5 and 6.) Roosevelt attacked this insanity with his 1935 Public Utilities Holding Company Act (PUHCA) and 1935 Federal Power Act, but the problem of finally bringing electricity to these rural areas remained.

The REA As Curvature

The Rural Electrification Administration (REA) emerged from a team functioning under the direction of Franklin Delano Roosevelt, through a series of decisions beginning with its creation on May 11, 1935. The August 1935 transfer of funding from crisis-relief funds turned the REA into a self-liquidating loan agency, and the 1936 REA act solidified the REA into a permanent supervisory and loan institution. Its loans were issued both for the construction of lines and for the purchasing of appliances by REA borrowers. These loans were issued at a 2 percent interest rate over an extended period of time, to facilitate the physical development of the areas involved. Of the three avenues possible for a loan program—loans to private companies, loans to municipalities, or loans to collaborative farm groupings called cooperatives—the last quickly emerged as the preferable route. A similar task of long-term low-interest credit generation and distribution for productive investment is being proposed today by Lyndon LaRouche (Figure 7).

A first look at the initial, local effects of Roosevelt's rural electrification program is revealing in itself. The forecasts of the utility companies and their accountants were proven to be stunningly inaccurate (wherever they were not also blatantly dishonest). Not only did farmers manage to find ways to utilize electricity, but in order to make their electricity use profitable *they had to devise as many ways as humanly possible to*

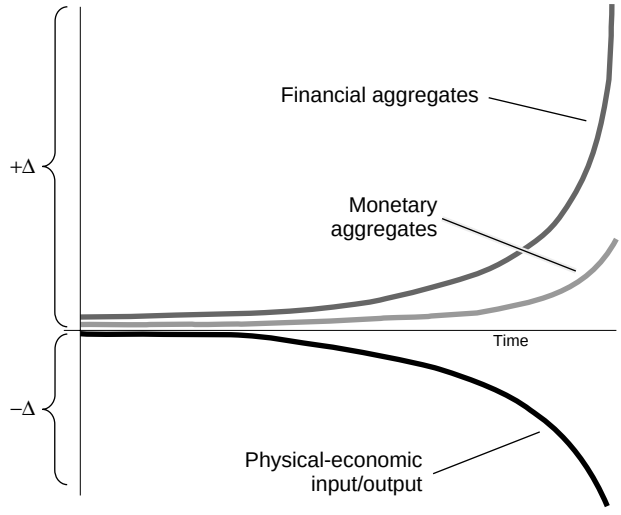


Figure 5 (a)
A TYPICAL COLLAPSE FUNCTION

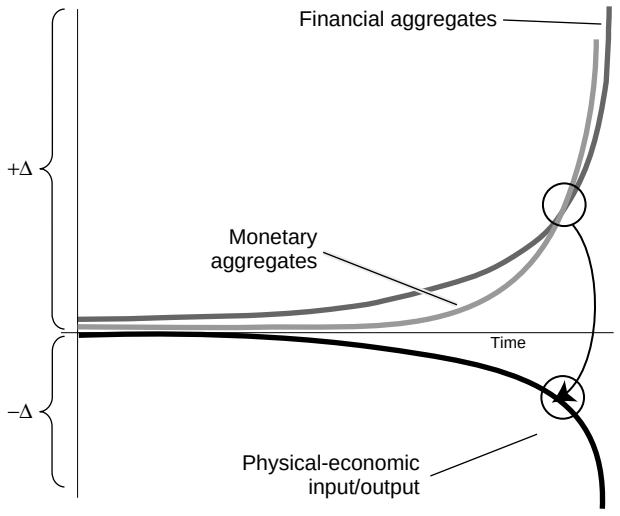


Figure 5 (b)
THE COLLAPSE REACHES A CRITICAL POINT OF INSTABILITY

The recent decade's jump in financial speculation represents a cancerous growth which has been steadily killing the global physical economy. As more and more of the world's resources (financial and otherwise) are funneled into maintaining "the markets," the possibility for the development of real wealth is destroyed.

Source: EIRNS

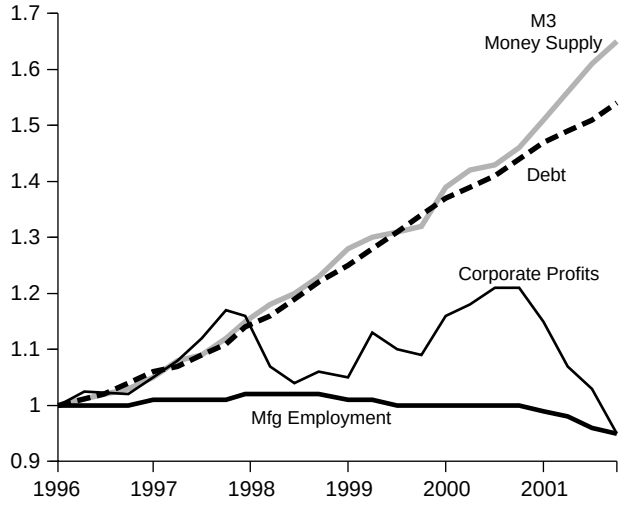


Figure 6 (a)
THE U.S. ECONOMY'S COLLAPSE FUNCTION SINCE 1996

Source: EIRNS

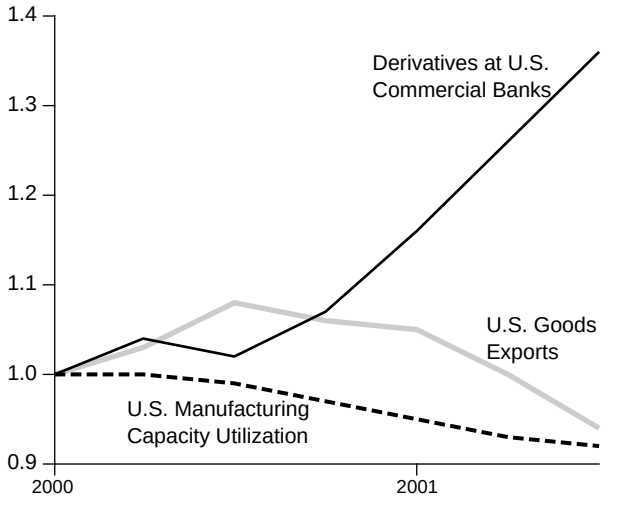


Figure 6 (b)
DERIVATIVES SOAR, MANUFACTURING FALLS IN 2001

Sources: FDIC, U.S. Department of Commerce, Federal Reserve

utilize electricity in their daily labor, and then some. A simple, first-order financial analysis showed that the costs paid by farmers for electricity did indeed shoot up dramatically—however, so did the returns as a result of increased *physical* productivity on the farms. So necessary was this rapid application of technology, that the REA began hosting what were called "circuses" (officially known as Farm Demonstration Tours) in which the multitude of uses for electricity in farm life were demonstrated—from cooking, washing, and lighting, to grinding feed, brooding chicks, and drying hay (Figure 8).

Most important, however, was the creation of free energy in the form of the creation of more *time.* For instance, the introduction of an electrically pumped water system, to replace the pumping and hauling of buckets of water by hand, *created, in*

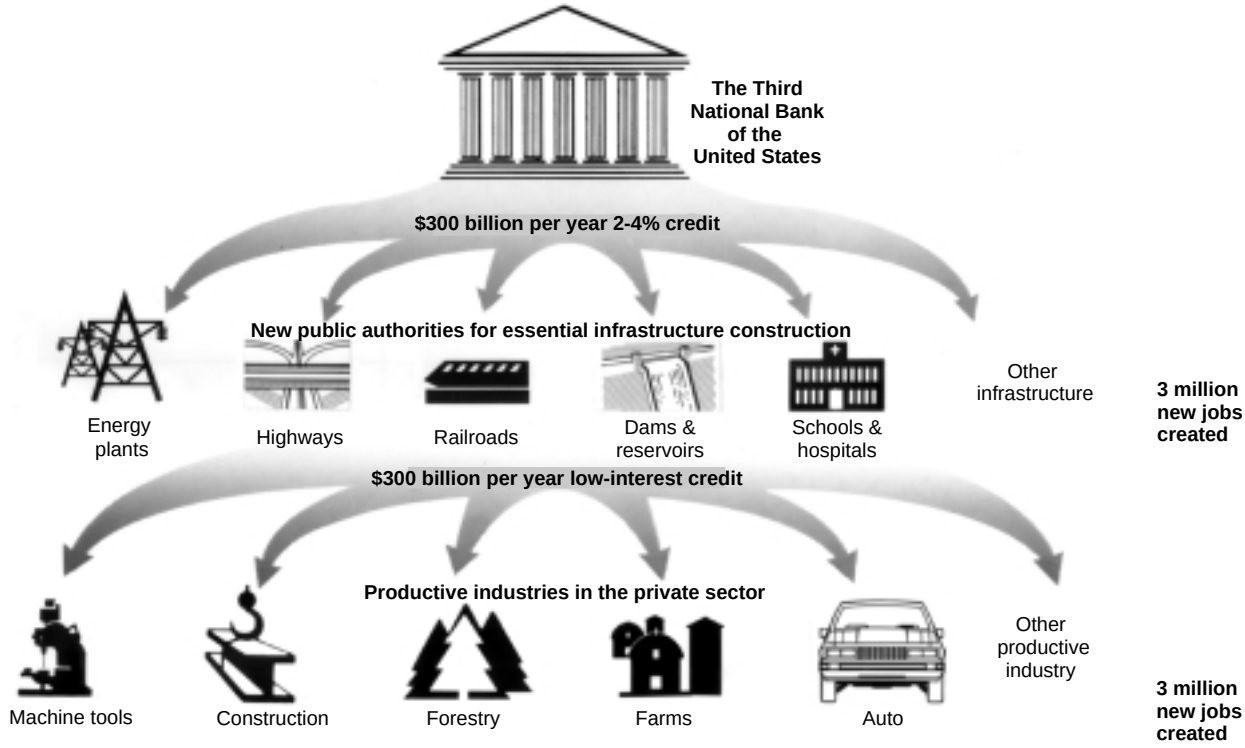


Figure 7

LAROUCHE'S THIRD NATIONAL BANK CREDIT STRUCTURE FOR FINANCING PHYSICAL-ECONOMIC GROWTH

In 1992, LaRouche proposed bankruptcy reorganization and massive investment in infrastructure and industry to create 6 million new jobs in the United States. He estimates that the comparable, scaled-up program required today would yield 10 million new jobs.

REA

Government created a boom in private production where private production, left to its own devices, would have suffocated itself, much like the sow, who, prior to the development of the pig brooder, "naturally" would tend to crush to death at least one piglet per litter under her own body weight. The interventions of human reason, whether represented by man's intervention into Darwinian "nature," or by Federal government's regulatory role in the development of economies (as opposed to Darwinian "free enterprise") is crucial to mankind's development.

effect, 30 extra 8-hour days of a single operative's activity per year. That is, prior to electrification, 240 hours were spent per year pumping and carrying water from its source. An equivalent amount of time was spent hand-separating cream, and again as much in cleaning and maintaining lights run on kerosene fuel.[9]

Thus, with these three technological injections alone, three months were added to the year for a farmer—months that were spent on increased physical production as well as newly discovered leisure time for various forms of intellectual development.[10] In particular, once electric lights had freed the farmer from dependence on daylight hours (including adding more time for nighttime pursuits such as reading, which did not otherwise exist), the deeper significance of the phrase *transformed potential* begins to become clear in discussing the life of the farmers.

Transforming Potential

In a number of his recent papers,[10] economist Lyndon LaRouche has stated that the idea of potential most applicable to the current discussion, is that laid down by Carl Gauss, in his essay on attractive and repulsive forces which act according to the inverse square of their distance,[11] as well as his work on Earth magnetism.[12] To understand the point made there, try this experiment: Take two strong magnets, and attempt to bring

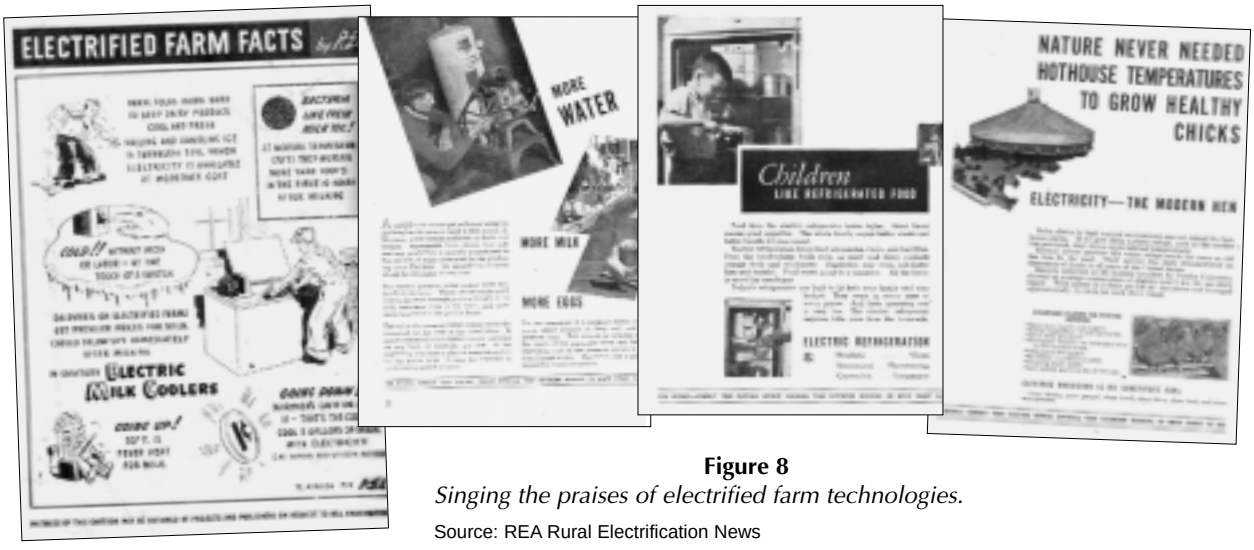


Figure 8
Singing the praises of electrified farm technologies.
Source: REA Rural Electrification News

them closer and closer to one another without allowing them to touch one another. What do you feel? It would seem that there is clearly some force acting to pull these two magnets closer together (or to keep them apart, depending on which direction you have them facing). Further examination of the strength of this apparent force would reveal that it lessens with distance. Moreover, this same dependency on distance exists for the observed gravitational and electrical forces as well. Specifically, they vary in proportion to the inverse square of their respective distances ($1/r^2$ if we set the distance equal to r). Take a second longer to play with the two magnets, and then reflect upon the force which holds you securely to the planet Earth.

Now, to understand the requisite idea of potential, simply understand this straightforward observation of Gauss: *There is no force acting to pull the two magnets you are holding together.* There is, in fact, *nothing* pulling on either magnet. No force. The "pull" you are experiencing is merely an effect observed by sense perception, and the "force" between the two magnets therefore has no existence in and of itself, but rather is merely the shadow of some other, actual phenomenon.

Think about this further: In the case of gravitation, what is it that causes two masses (you and the Earth, for instance) to attract one another? Gravity? What is that? Most people, when asked, would reply with the tautology that it is the force which causes two masses to experience a mutual acceleration. How do we know that this force exists? Because the masses present are undergoing an acceleration, and Newton's celebrated equation states that $F = ma$ (force equals mass times acceleration). Therefore, what is the force which causes two bodies to attract? Well, the force which causes two bodies to attract. . . . This circular reasoning is no game, but rather is a product of attempting to explain the properties of shadows by the shadows themselves (like a physicist attempting to explain the clearly observed effect of the shadow of a bat on the shadow of a baseball)[13] (Figure 9).

Rather than be caught in this trap, Gauss took the discoveries he had made transforming the sense-perceptual concept of curvature into an actual principle[14] of the transformation of a set of relationships defining a potential for action, and applied them to the phenomena of gravitation, electricity, and magnetism in order to develop a concept of a *potential field.*[15] To describe the effects of the transformation of such a potential field, Gauss's student Riemann elaborated Gauss's own original work on functions of a complex variable. Gauss had recognized that the doubly extended nature of complex num-

Brendon Barnett

Figure 9
HOW DOES ONE SHADOW MOVE THE OTHER?

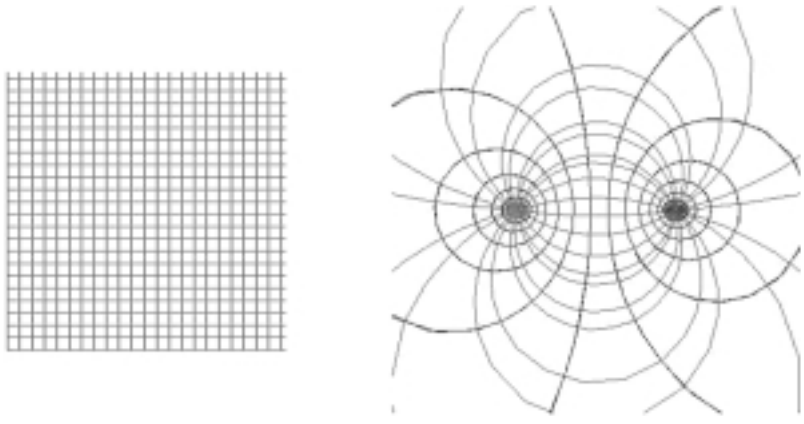
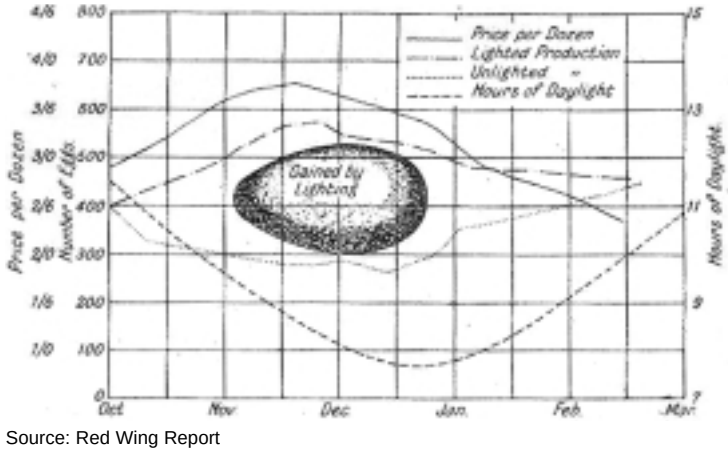


Figure 10
THE COMPLEX SINE

Gauss recognized that the doubly extended nature of complex numbers allowed them to be represented, in their entirety, on any surface. Any transformation of the relative positions of these numbers, therefore, as in the case of applying a mathematical transformation, corresponded to a transformation of the least-action lines of one surface to those of another. Here, the complex sine function.

Source: Bruce Director

(a) Gain in egg production as a result of electric lighting

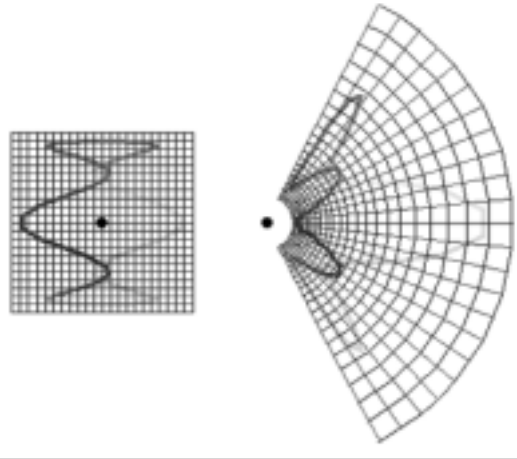


Source: Red Wing Report

Figure 11
EGG PRODUCTION WITH AND WITHOUT ELECTRICITY

Under normal conditions, chickens lay considerably fewer eggs in winter and at night. Without changing this built-in property of the chicken (by, perhaps, building a new chicken), we can simply transform the physical space-time manifold in which the chicken operates (a). The chicken, now, by performing exactly the same action, though in a different manifold, produces an entirely different result. This concept is represented graphically in (b).

(b)



bers—numbers utilizing the quantity $\sqrt{-1}$—allowed them to be represented, in their entirety, on any surface. The only difference in each case would be the relative positions of the complex numbers. Any transformation of the relative positions of these numbers, therefore, as in the case of applying a mathematical transformation, corresponded to a transformation of the least action (or geodesic) lines of one surface to those of another (Figure 10).

Now, take this idea of *potential,* as that "curvature," or set of relationships, which defines the possibility for action, and apply it to our initial discussion. What is it exactly that causes the transformations of the scalar magnitudes of time, productivity, and the more complicated but superficially scalar quantity of standard of living? Might these observable effects be but the shadows of an underlying, transformed set of relationships? Or, more interesting for our present-day purposes, what sorts of action on that underlying *field* could produce the desired effect on magnitudes such as the above-mentioned *potential relative population density* of the human species? We will take this question, already alien to modern day, university-trained "economists" (really just glorified accountants, and shoddy ones at that) such as Alan Greenspan, and return to our earlier discussion of the Roosevelt-era Rural Electrification program.

Dirichlet's Principle and Physical-Economic Potential

To discover what it is that defines the economic *field* in the case of the productivity increase felt by the FDR economy, we'll take our cue from what Riemann named "Dirichlet's Principle," and identify what

constitute the singularities and boundary conditions which define the potential for action in that case. For this, remember the role of physical-economic infrastructure and machine tools as the physical medium by which the introduction of a new scientific principle into human activity is effected. These things define the boundary condition of an entirely new phase space, in which even activity in the non-rural areas of the economy is transformed by virtue of its new relative position (*analysis situs*).

The appliances demonstrated in the REA farm circuses, as well as those demonstrated at co-op meetings, were entirely the products of private enterprise. Thus, contrary to the simplistic fantasies which Shultz's Arnold Schwarzenegger would like to transfer straight from his movies to economics, government created a boom in private production where private production, left to its own devices, would have suffocated itself.

The new technology produced to effect rural electrification (particularly when viewed in connection with the full effect of Roosevelt's other infrastructure-development projects), produced an explosion in the manufacturing sectors of the economy which were otherwise far removed from the drastic transformations taking place in rural America. By the time of the mobilization for World War II, the Nazis, fortunately for humanity, were facing a transformed United States as a result of this transformed potential. Roosevelt had created the possibility for the United States to shoulder *more than half* of the productive burden of the war.[16]

Roosevelt's Secretary of Agriculture, Henry A. Wallace, called for a 25 percent increase in crop and livestock production: 13 billion pounds of hogs, 128 billion pounds of milk, 4 billion pounds of chickens, 52 million acres of wheat, 88 million acres of corn, 23 million acres of cotton.[17] This burden, impressive enough on the face of it, was aggravated by the fact that the farmers, in most cases, had already sacrificed much of their able-bodied workers to the war effort. It was only because of the prior internal transformation experienced under Roosevelt's REA, that this increase in scalar output was possible. Just as it is the internal (geometric) reorganization of a machine, which allows a higher density of its output in the form of energy flux density, without necessarily requiring an increase in the actual energy brought to bear (Figure 11, a and b).

It is precisely this method of directed credit generation and massive investment in high-technology infrastructure production that is needed for the United States today. For the modelling of the desired processes, we must look to the further development of Gauss's concept of a potential field, by the work of Bernhard Riemann on multiply extended magnitudes as well as his work on Abelian functions.[18] The possibility of real-time modelling of these sorts of processes, using actual economic data, represents a characteristic phase shift in the science of physical economy. This involves projecting and analyzing seeming infinities in order to effect a transfinite shift in the expression of various scalar economic magnitudes, by acting on the multiply connected relationships which constitute an economic "field."

Along with a much-needed policy shift, we would also have created the possibility of harnessing a phenomenon once experienced only intermittently in human history—this capacity for surpassing the physical boundaries on human development—and transforming it into the sole, consciously directed element of human economics. This return to the practice of economics as a true science, as opposed to the lunatic casino approach being applied today, will be a crucial accomplishment of the LaRouche Youth Movement in the period immediately ahead, and must become a critical area of our focus.

Sky Shields is a leader of the LaRouche Youth Movement from Los Angeles.

Notes

1. Lyndon H. LaRouche, Jr., "Cauchy's Infamous Fraud," and "How Most Economists Became Illiterate," *Executive Intelligence Review,* April 1, 2005.
2. A more thorough discussion of this period can be found in the book-length report *Economics: End of a Delusion,* which features a theoretical essay of the same name by Lyndon LaRouche, as well as a study of the Franklin Roosevelt recovery measures, written by Richard Freeman. Copies of this study may be obtained by contacting *Executive Intelligence Review* magazine through its website http://www.larouchepub.com.
3. Deward Clayton Brown, *Electricity for Rural America: The Fight for the REA* (Westport, Conn.: Greenwood Publishing Group, 1980).
4. This phenomenon is seen today in impoverished parts of the world (including the United States), and is often attributed by the ignorant, or those in wishful denial, to either "laziness," or worse, to some sort of Nazi-eugenics-inspired concept of racial inferiority.
5. This should remind readers of the current arguments against development of so-called "Third World" areas of the world today.
6. The reader is also encouraged to further research the work of Nicholas of Cusa (1401-1464) to obtain a rigorous, non-fundamentalist concept of an infinite God.
7. This recognition forms the basis of Cusa's discovery of the transcendental nature of *pi.*
8. Bernhard Riemann, "On The Propagation of Plane Air Waves of Finite Magnitude," *International Journal of Fusion Energy,* Vol. 2, No. 3 (1980).
9. A similar free-energy effect would be experienced with the introduction of an integrated mass transit system for areas such as Los Angeles. However, the opposite, disastrous slowing-down effect is to be expected from the Bush Administration's current planned elimination of Amtrak, our national rail system.
10. See "Cauchy's Infamous Fraud" (*Executive Intelligence Review,* April 1, 2005). "The Power to Prosper" (*Executive Intelligence Review,* April 29, 2005), "The Revolutionary Aspect of LaRouche's Method" (*Executive Intelligence Review,* May 13, 2005).
11. Carl Gauss, "General Propositions Relating to Attractive and Repulsive Forces Acting in the Inverse Square of the Distance," available on the LYM website at http://www.wlym.com/›jross/curvature/.
12. Carl Gauss, "The Intensity of the Earth's Magnetic Force Reduced to Absolute Measurement," translated from the German by Susan P. Johnson, available on the *21st Century* website at http://www.21stcenturysciencetech.com/Translations/gaussMagnetic.pdf.
13. The scalar quantity of energy is another such shadow magnitude. Although true in all parts of the physical sciences, this fact is most obvious in the field of physical economy. The attempt to manage an economy by simple accounting measures of energy input and output will tell you next to nothing of real significance about actual economics. Rather, the true economist (as opposed to the mere accountant) will concern himself with the geometric properties of a piece of machinery (or economy as a whole) which transforms the amount of energy brought to bear per unit of area.

    For this reason, Lyndon LaRouche developed the geometric concept of *energy flux density* as a measure with true ontological significance, unlike "energy," which is simply its observed effect. Other such effects are the shadow quantities called "mass," "velocity," "acceleration," and "momentum."
14. See note 11.
15. This is not to be mistaken for Maxwell's concept of the field, as taught in universities today.
16. Thus, contrary to mythology, it was Roosevelt's economy created *first* which won us the war, and not vice-versa.
17. Marquis Childs, *The Farmer Takes a Hand: The Electric Power Revolution in Rural America* (Garden City, N.Y.: Doubleday, 1952).
18. Further discussion of the work of Gauss and Riemann will be taken up in an ongoing pedagogical article series, "Riemann For Anti-Dummies," written by LaRouche colleague Bruce Director. The entire series can be found at http://www.wlym.com/ under the section header "pedagogicals."